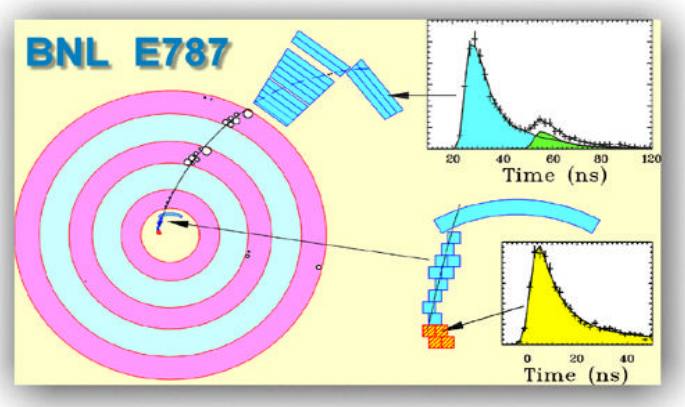
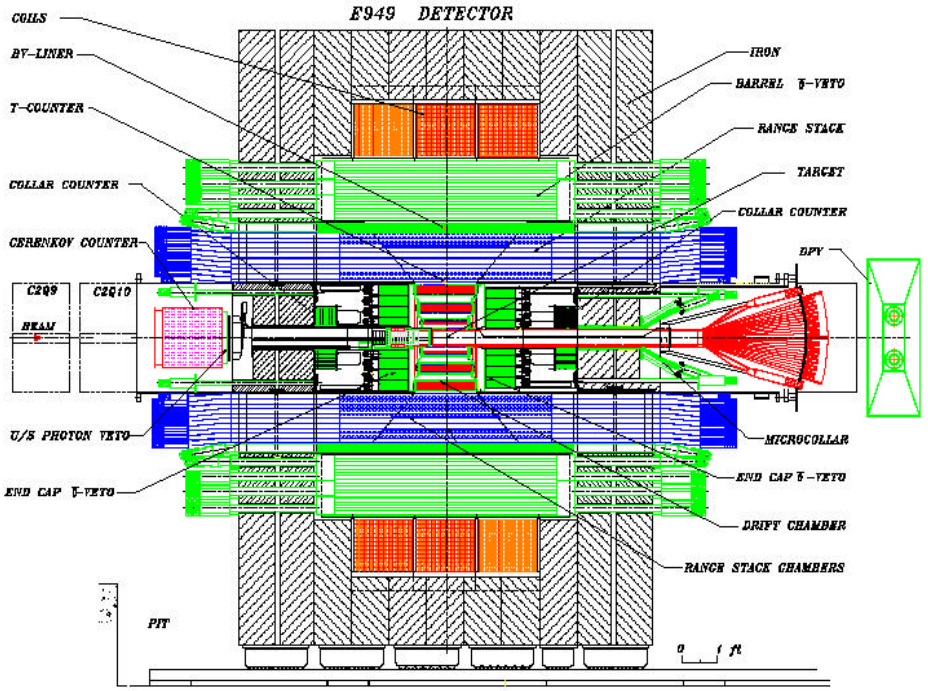
Rare K Decays: Results from E949

Steve Kettell

BNL

E949 – Measurement of B($K^+ \to p^+ n\bar{n}$)





$75M Expenditure including $10M Upgrade of E787

Contributing Countries and Institutions:

US --- BNL, FNAL, University of New Mexico, Stony Brook

Japan --- Fukui, KEK, Kyoto, National Defense Academy, Osaka, RCNP

Canada --- Alberta, University of British Columbia, TRIUMF

Russia --- IHEP, INR

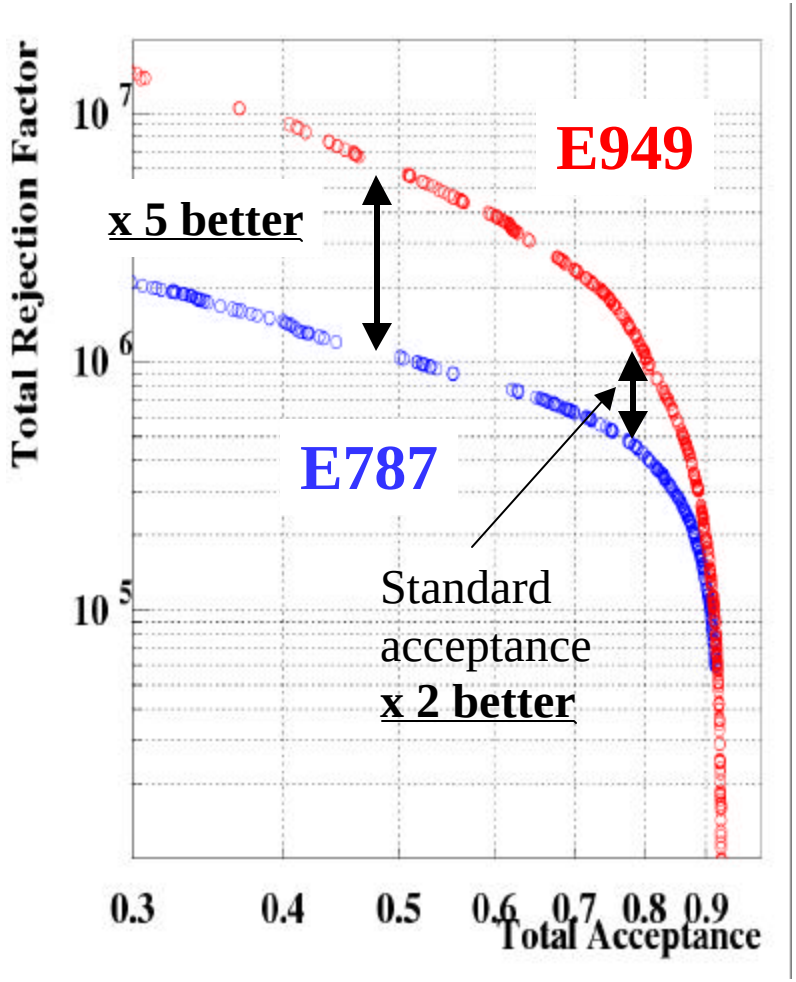
E949 Upgrades

- **`Higher' flux, `increased' duty factor**
- ***Improved photon veto system***

Lower phase space now acccessible

- **Trigger/DAQ – reduce deadtime, enable operation at higher rate**
- **RS gain monitor – improved p^+ energy resolution**
- **Electronics – improved range and momentum resolution**
- **Beam systems – improved detectors and electronics**

p^0 Rejection vs. Acceptance



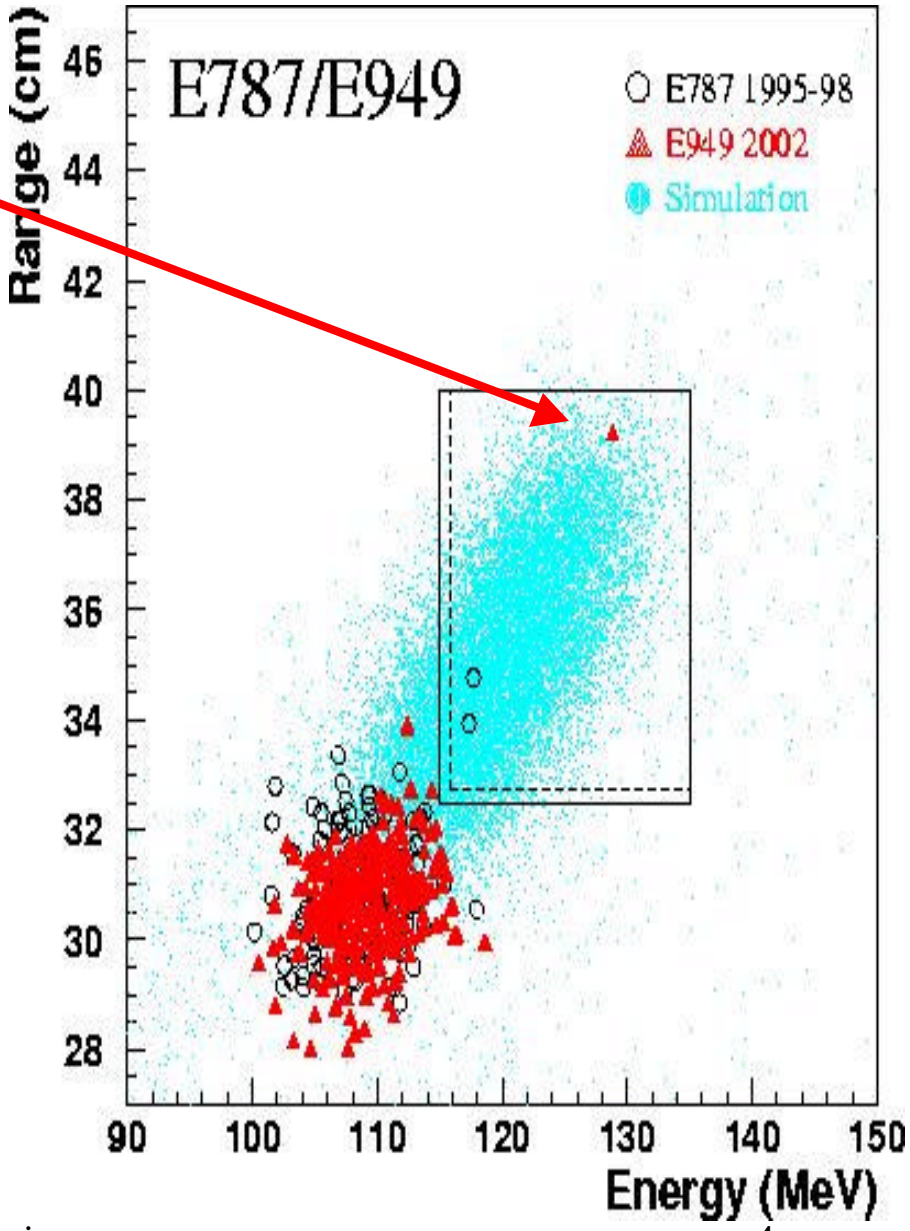
E949 Results

- E949 has observed a **3rd** $K^+ \to p^+ n\bar{n}$ event:

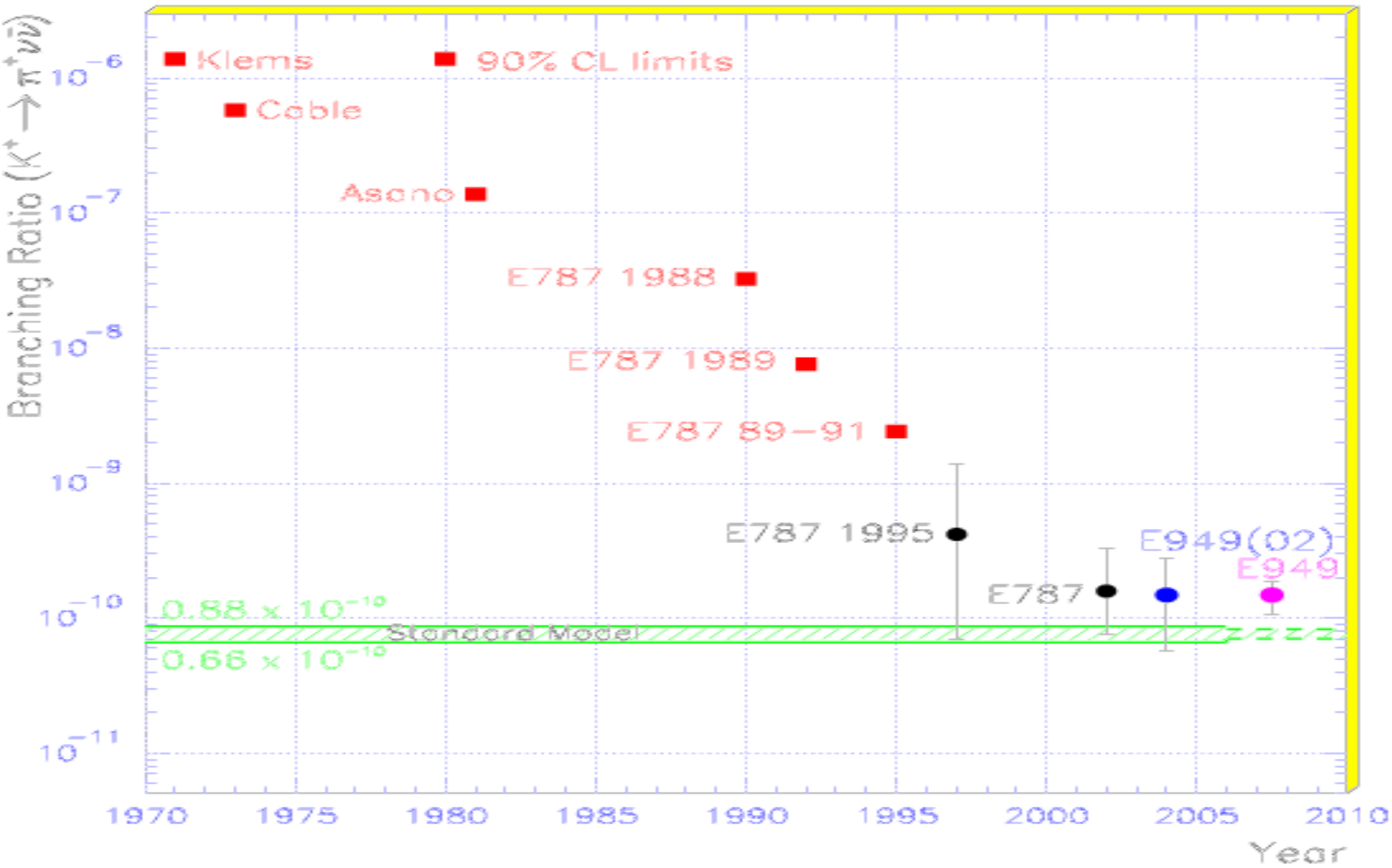
$$B(K^+ \to p^+ n\bar{n}) = 1.47^{+1.30}_{-0.89} \times 10^{-10}$$

(SM: 0.8 ´ 10^{-10})

  - $0.006 < |V_{td}| < 0.027$
  - $-0.8\times10^{-3} < Re\lambda_t < 1.1\times10^{-3}$
  - $0.2\times10^{-3} < |\lambda_t| < 1.1\times10^{-3}$
  - $|Im\lambda_t| < 0.9\times10^{-3}$
- Submitted to PRL



Progress in $K^+ \to p^+ n\bar{n}$



Summary

- E949 observed a 3rd $K^+ \to \pi^+ \nu\bar{\nu}$ event – consistent with the SM prediction but twice the expectation.
- Lower Phase space region accessible - results next year with similar sensitivity (double E949 sensitivity).
- Detector and collaboration ready to complete experiment but …?
- Proposal to complete E949 submitted to NSF.
- Together, E949 and KOPIO provide a unique opportunity for discovery of new physics.

Possible manifestation of new physics